

# Safe Handling of Food and Water in a Hurricane or Related Disaster<sup>1</sup>

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The following is a summary of general recommendations to protect food and water in the event of a hurricane, flooding, or related natural disaster. These recommendations have been adapted from those developed by the American Red Cross and the Centers for Disease Control and Prevention (CDC), Environmental Protection Agency (EPA), Food and Drug Administration (FDA), Florida Department of Agriculture and Consumer Services (DOACS), Florida Department of Health (DOH), Federal Emergency Management Agency (FEMA), and World Health Organization (WHO).

## Emergency Preparation (Before the Storm)

### Have a Plan

As hurricane season approaches, a written plan should be developed for your household. The plan should be reviewed frequently with all members of the household.

### What to Include in the Plan

At a minimum, the plan should include the following:

#### 1. ESSENTIAL ITEM CHECKLIST

Make a list of items considered essential in the event of an evacuation (e.g., special medications, foods for those on special diets), and collect these items in one location.

#### 2. ADEQUATE CONTAINERS, UTENSILS, AND PAPER GOODS

Collect several food-grade containers for storing water and food. These containers should be lightweight and easy to carry to make a potential evacuation more efficient. Collapsible water containers are available online and at camping supply stores. Maintain a supply of disposable utensils (e.g., forks, knives, spoons, cups), as well as a manual can opener. Finally, maintain an adequate supply of paper goods (e.g., paper towels, toilet paper). As the supply of clean water may be limited following an evacuation, it is recommended that sanitary hand wipes be purchased. While these hand wipes do not replace hand washing, they can be used in the event that clean water and/or soap is unavailable.

#### 3. DISASTER SUPPLY KIT

Assemble a “kit” (to fit in the trunk of your vehicle), which includes non-perishable food and water (for a minimum of 24 hours) and other disaster supplies. This disaster supply kit should be updated annually.

#### 4. REFRIGERATOR AND FREEZER

Organize and prepare the refrigerator and freezer (where time allows) as follows:

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- A thermometer should always be maintained in the refrigerator, and the temperature should be kept at 40°F (4.4°C) or less. However, in preparation for a possible power outage, it is recommended that the temperature controls be set colder than normal
- Clean the refrigerator and freezer, and examine the gaskets, replacing those that are worn
- Discard old or unnecessary items
- Take an inventory of food items and post the inventory list in an accessible location
- Organize the freezer compartment by grouping meat and poultry on one side or on separate trays so that, in the event of thawing, their juices will not contaminate each other or other foods
- If the freezer is not full, fill and freeze water containers to fill the space. This will slow the temperature increase in the event of a power failure.

## 5. WATER SUPPLIES

Evaluate the water needs of your family. It is recommended that you maintain at least a two-day supply of water. Allow a sufficient quantity per day for drinking (1 gallon/person), food preparation (one-half gallon/person), and hygiene (one-half gallon/person). In hot weather, allow more water for drinking (2 gallons/day). Commercially bottled water is best if available. If you do not have commercially bottled water, other sources of emergency water may be used. Assess and make a list of potential emergency water supplies available to your household. Some recommendations suggest filling bathtubs with water as a water source (for non-drinking purposes). Be sure the tub is cleaned thoroughly prior to filling. The toilet tank may also be used as a source of water. These water sources may be used for bathing or shaving without purification, provided that care is taken not to swallow the water. However, if water stored in either of these places is to be used for drinking, hand washing, washing fruits and vegetables, dishwashing, or cooking, it should be purified (or sanitized) using a recommended procedure as described later (see the section “Water Handling”). In preparation, the following should be purchased and maintained:

- Commercially bottled water (several bottles)
- Non-scented liquid chlorine bleach (several bottles)

## 6. FOOD SUPPLIES

A sufficient quantity of shelf-stable, non-perishable foods should be maintained on hand. Recommendations include:

- Canned foods such as vegetables, soups, condensed milk, canned meat, canned fruit and fruit juices, and nuts
- Dry foods such as powdered milk, dried fruit, pasta, rice, instant coffee and tea, cocoa, and crackers
- Potatoes and other shelf-stable vegetables
- Ready-to-eat cereals
- Soft drinks
- Other easy-to-prepare or ready-to-eat foods

A variety of freeze-dried food items are also available on online shopping sites or at camping supply stores. These outlets may also stock “self-cooking” food items and other innovations.

It is important that family members maintain their health and wellness during and after the storm. Therefore, be sure to consider nutrition as well as the likes and dislikes of family members (especially children) when stocking up on food.

## 7. DRY ICE

It is recommended that you locate a dry ice supplier in your area. Dry ice is not available in all locations.

## Evacuation

If evacuation is required, follow instructions from local agencies and evacuate to the designated evacuation site. Take essential items with you.

## Assessing In-Home Damage and Needs (After the Storm)

The following is a list of recommended areas to consider when assessing damage and emergency needs, either following the storm or when returning home from an evacuation:

### Structural and Related Damage

#### 1. ELECTRICAL AND STRUCTURAL SYSTEMS

Use care in examining these services and systems for damage. Consult a professional as needed.

#### 2. FLOODING OR RAIN INTRUSION

If flooding has occurred, inspect the area for hazardous chemical containers that may have been buried, moved, or have leaked. Flooding may also carry silt, raw sewage, oil, and other chemicals into your house. Leaking from structural damage to the roof may also cause contamination of food and food contact surfaces.

### 3. WATER SUPPLY AND PLUMBING

Examine (or have a professional examine) your plumbing for damage. Consult local authorities regarding the potential safety of the water supply or have the water supply tested (especially wells, cisterns, or springs) for safe use. The local Health Department will usually issue a *Boil Water Advisory* via the news media if the municipal water supply is considered contaminated or at risk.

## Emergency Provisions

### 1. EMERGENCY WATER

Examine your emergency water supplies to ensure they have not become contaminated. Any water from these emergency sources should be decontaminated or purified using one of the procedures described in the “Water Handling” section.

### 2. FOOD

Assess whether food items have become contaminated or perishable foods have been held at an unsafe temperature due to a power outage. See the “Food Handling” section below for further procedures.

### 3. FOOD UTENSILS AND OTHER NON-FOOD ITEMS

Assess whether there has been contamination of food utensils, paper or plastic items, medicines, or any other items that will come in contact with food or the mouth.

## Emergency Procedures

### Water Handling

If the water supply is contaminated, or if you are under a *Boil Water Advisory*, all water used for drinking, hand washing, washing fruits and vegetables, dishwashing, or cooking must be purified (e.g., disinfected or sanitized). Certain precautions must be taken when handling water. They are outlined below.

### PURIFYING WATER

The most common methods for purifying water include boiling, using commercially available purification kits, or using common household chemicals. If performed according to recommended procedures and conditions, these water purification methods adequately remove unwanted infectious bacteria or other biological contaminants from most water. It should be noted, however, that none of these methods will purify water contaminated with hazardous chemicals. In addition, the presence of suspended soils and other contaminants in water decreases the effectiveness

of water purification or disinfection. Prior to purification, water with suspended soils should be allowed to sit for sufficient time to allow the settling of the impurities. It should then be decanted and filtered through several layers of cloth or paper towels. If the water is cloudy after these treatments, longer boiling times or high chemical concentrations are usually recommended.

The recommended water purification procedures are as follows:

This is a relatively easy water purification technique to perform. However, this option may not be available when the power is out. If boiling is used, the water should be brought to a rolling boil for at least 1 minute and allowed to cool before dispensing into a clean, sanitized, tightly capped container. Water that is cloudy should be boiled longer (3–5 minutes). If your area is under a *Boil Water Advisory*, follow the health department’s recommendations, which may involve longer boiling times if more heat-resistant parasites and certain protozoa (e.g., *Giardia*, *Cryptosporidium*) are suspected as contaminants. In general, boiling is more effective at killing these pathogens than most chemical methods.

Commercial water purification kits are available from online shopping outlets, pharmacies, camping and outdoor supply stores. These kits range from chemical disinfectants (liquid or pellets) to water filtration devices. These kits are generally designed for small quantities of water and, thus, may not be practical for large quantities. If a purification kit is used, closely follow the recommended procedures on the label.

The most common chemicals used for water purification in the home include chlorine bleach or iodine. If used properly, the water will not be toxic after using these chemicals but may have an odor or taste.

### A. Household Chemicals Used

1. **Chlorine Bleach.** There are many different types of bleach on the market. Read the label to ensure sodium hypochlorite is the only active ingredient. Do not use bleach solutions that contain detergents or other chemical components (e.g., scented bleach). If the container has a label warning “not for personal use,” it should not be used. Fresh, unopened, liquid laundry bleach contains 5.25% sodium hypochlorite. However, a bottle of bleach that has been open for an extended period of time may lose some of its strength, especially if the container is only partially full.

2. **Iodine.** Iodine tablets and liquid iodine (*Tincture of Iodine*) can also be used to purify water. Again, read the label for recommended procedures. *Tincture of Iodine* usually contains 2.0% USP iodine. However, there are some differences in these products. In general, iodine has the disadvantage (compared to chlorine) in that it is not as effective over a wide range of pathogens and imparts taste and a brown tint to the water. Thus, it should be used only when chlorine is not available.

## B. Purification Procedure

1. Add the recommended level of the chemical (Table 1) using a clean, uncontaminated medicine dropper or suitable utensil. The following conversions may be helpful in determining the correct amount:

- 8 drops = 1/8 teaspoon
- 16 drops = 1/4 teaspoon
- 32 drops = 1/2 teaspoon
- 64 drops = 1 teaspoon
- 192 drops = 1 tablespoon
- 384 drops = 2 tablespoons (1/8 cup)

2. Stir the chemical thoroughly into the water. If the water does not have a faint chemical smell after the 30-minute waiting period, add another dose and let it sit for an additional 15 minutes.

3. Allow the water to stand for 30 minutes. If the water is cloudy, repeat the procedure.

4. Dispense into a clean, sanitized, and tightly capped container, which has been appropriately labeled to indicate its contents.

## STORING WATER

Conserve water as much as possible and handle purified water with care. It defeats the purpose of purification if the water becomes re-contaminated. If stored in a tight container in a cool, dry, dark place, commercially bottled and purified water is safe for an indefinite time period. However, once opened, it should be used within 2–3 days (or re-purified). Do not store water in direct sunlight, and do not store it next to gasoline, kerosene, pesticides, or similar substances. To improve the taste of stored water, pour it back and forth between two clean containers several times to aerate it prior to use. The FDA does not specify a shelf life for bottled water, though some companies recommend consuming any bottled water within two years of the manufactured date.

## Ice Handling

Freezing does not purify water, and just because it is cold does not mean that ice is safe. Therefore, unless there is absolute certainty that ice is free of contamination, it should not be used for drinks or be in direct contact with food. Any potentially contaminated ice that is melted and used should be purified as described above.

## Dry Ice Handling

If available, dry ice can be used to maintain frozen foods in the event of a power outage. Use approximately 25 pounds of dry ice per 10 cubic feet of freezer or chest space. The following precautions should be observed when using dry ice:

- Dry ice is much colder than any freezer; it instantly freezes skin. Avoid contact with skin. Use gloves or cloths to prevent skin contact.
- Only use dry ice in rooms with adequate ventilation, as dry ice emits carbon dioxide gas when thawing. If used in a confined freezer compartment, do not cover vent openings.
- Do not eat dry ice. It is not for consumption.

## Food Handling

### WHAT TO DISCARD

Carefully evaluate which food to discard. Remember to follow these two adages: *it is better to be safe than sorry*, and *when in doubt, throw it out*. Discard all food products that may have come in direct contact with floodwaters, may have otherwise become contaminated, or may have been stored at an unsafe temperature.

## FOLLOW GOOD SANITATION PROCEDURES

When handling food, use appropriate precautions so as not to contaminate the food. This includes washing your hands (using clean, purified water) before handling food and preventing cross-contamination by avoiding contaminated surfaces or objects. In extreme conditions where the purified or potable water supply is strictly limited, hands may be washed in non-potable water, followed by the use of a hand sanitizer or hand sanitizer wipes following label recommendations.

## RECOMMENDED ORDER OF FOOD USAGE

In general, if there has been a power outage, it is recommended that perishable foods from the refrigerator or pantry be used first. Then, use the foods from the freezer, followed by non-perishable food supplies. The following

guideline can be used to estimate the approximate time that food may be held at appropriate cold temperatures:

- **Refrigerator:** if kept closed, approximately 4 hours
- **Full freezer:** if kept closed, approximately 48 hours
- **Half full freezer:** if kept closed, approximately 24 hours and
- **Dry ice:** 2 to 3 days.

## HOW TO HANDLE SPECIFIC FOOD CATEGORIES

All fresh fruits and vegetables, garden produce, and related fresh foods should be discarded if exposed to floodwaters. If contaminated, these foods cannot be adequately cleaned and sanitized.

In general, if there is a power outage, a well-insulated freezer or refrigerator will maintain refrigeration or freezing temperatures for several hours, provided the door is kept closed and only opened as often as necessary. However, it is recommended that you monitor the refrigerator's temperature periodically. Remember that you cannot rely on appearance or odor to determine whether a food will make you sick. Your only indication of safety is temperature control. If the refrigerator temperature has risen above 40°F (4.4°C) for 2 hours or more, discard all perishable foods. If you return to the house after an evacuation of several days and the refrigerator is above 40°F (4.4°C) upon your return, discard perishable foods, as you don't know the length of time the food has been at an unsafe temperature. A partial list of foods typically found in a home refrigerator has been categorized as perishable vs. more stable and less perishable in Table 2.

Examine frozen food for evidence of thawing. This should be done with care. As mentioned above, a general safety rule is that food should not sit out at a temperature above 40°F (4.4°C) for 2 hours or more. This also applies to frozen foods if they have thawed. Just because the food has thawed does not mean it is unsafe. It is the total time the food has spent above 40°F (4.4°C) that matters. If upon returning from an evacuation, the temperature of the freezer is at 40°F (4.4°C) or above, and all food has thoroughly thawed, simply discard the food unless you have an accurate indication of how long the food had been under these conditions. However, food that has been thawed and refrozen due to the power cycling off and on over an extended period is more difficult to assess for damage given its time and temperature history. Thus, if you have reason to suspect that the food has been thawed and refrozen over an extended period, the safest plan is to discard it. If you have

reasonable certainty that the temperature in the freezer had not been above 40°F (4.4°C) for 2 hours or more, the following recommendations can be followed:

**A. Partially frozen food** (with ice crystals in the center) should be safe. In addition, such food that contains ice crystals may be refrozen (when the power comes back on) without concern.

**B. Fully thawed food** (no ice crystals) can be consumed, provided it has not been held for 2 hours or more at 40°F (4.4°C). Such thawed food may be cooked then refrozen, provided it has been held at 40°F (4.4°C) or less for no more than two (2) days.

**C. Risk of food contamination.** In the event of a flood, canned foods and beverages in metal (including pull-top cans) or glass containers run the risk of becoming contaminated if exposed to flood waters. Use extreme care and discard any screw-capped bottles, snap-lid cans, and similar containers exposed to flood waters. To sanitize the outside of metal cans prior to opening, remove the labels and follow one of the following procedures:

- Completely immerse the cans in water and bring the water to a rolling boil for one (1) minute (Caution: Do not boil carbonated beverage containers); allow to cool, remove, and air dry prior to opening; or
- Completely immerse the cans in clean water (room temperature) containing two (2) teaspoons of chlorine bleach per quart of water or three (3) tablespoons of chlorine bleach per gallon of water for 15 minutes; remove and air dry prior to opening.

**D. Sanitizing the outside of food containers.** Tightly sealed metal cans with no evidence of bulging, swelling, seeping, or other damage may be safe for use, provided the outside of the containers are carefully and thoroughly cleaned with a detergent and sanitized prior to opening.

**E. Handling and storage of sanitized containers.** Following sanitizing, relabel (using a permanent marker) and store the cans where they will not be re-contaminated. As metal cans that have been sanitized may rust, they must be used as soon as possible. As an additional precaution, thoroughly cook the food products from these cans.

**F. Exposure of containers to hazardous materials.** In an urban or industrial environment with extensive flooding, there is an increased risk that the outside of the cans have been exposed to hazardous chemicals. In this case, it is recommended that the cans be discarded.

The seals of home canned foods may not be as tight or complete as those on commercially canned food products. Thus, it is generally recommended that if home canned foods have been exposed to floodwaters or otherwise contaminated, they should be discarded.

Dry foods that have become wet from contact with flood or rainwater should be discarded. Other dry foods, if properly stored to avoid contamination, are generally considered safe.

## FOOD DISPOSAL

Food disposal may be done with normal garbage pickup. However, if garbage pickup is delayed for an extended period, spoiled and deteriorated food will create a nuisance and pest problem. In this situation, the discarded food may be buried in the ground to a depth of at least one foot.

## FOOD PREPARATION

The following tips can be used in cooking and preparing food:

If the electricity is off, alternative cooking methods may be used (with appropriate caution). Use extreme care when using open flames. Charcoal grills and camp stoves should not be used to cook indoors but can be used outdoors. Many ready-to-eat foods (commercially canned) can be eaten without heating or cooking.

Use purified water or water from a safe source to wash fruits and vegetables and to dilute concentrated or powdered food products.

Use canned or prepared baby formula that requires no added water if possible. Use only purified or safe water to dilute concentrated or powdered formula.

## Non-food Items Intended for Food or Mouth Contact

Paper and plastic items and items packaged in plastic cannot be adequately cleaned and sanitized. Therefore, all medicines, cosmetics, baby pacifiers, and bottle nipples that may have become contaminated should be discarded.

## Food Utensils and Food Preparation Areas

### 1. WHAT TO USE AND WHAT TO DISCARD

Evaluate all food utensils and food preparation areas that may have become contaminated with flood waters. Discard any potentially contaminated paper or plastic utensils and wooden or plastic cutting boards. All other potentially

contaminated food utensils (e.g., pots, pans, glasses, dishes) may be used if properly cleaned and sanitized.

## 2. CLEANING AND SANITIZING FOOD UTENSILS, EQUIPMENT, AND PREPARATION AREAS

Food utensils and equipment that will fit in the sink should be washed thoroughly in detergent solution, rinsed in purified or safe water, and sanitized as follows:

A. Completely immerse in clean water and bring it to a rolling boil for 1 minute; allow to cool, remove, and air dry prior to use; or

B. Completely immerse in clean water (room temperature) containing two (2) teaspoons chlorine bleach per quart or three (3) tablespoons chlorine bleach per gallon for 15 minutes; remove and air dry prior to use.

Food preparation areas, large food preparation equipment, the inside of refrigerators, and all other food contact surfaces should also be cleaned thoroughly and sanitized using a bleach sanitizing solution (as described above).

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Table 1. Recommended concentrations of chlorine bleach or iodine products for water purification.

Volume of Water to Be Purified	Recommended Amount of Chemical		
	Chlorine (bleach) <sup>1</sup>	Iodine Tablets <sup>2</sup>	Tincture of Iodine <sup>3</sup>
1 quart (1 liter)	4 drops	2 tablets	½ drop
½ gallon (2 liter)	8 drops (⅓ teaspoon)	4 tablets	1 drop
1 gallon (4 liter)	16 drops (⅔ teaspoon)	8 tablets	2 drops

<sup>1</sup> Fresh, unscented laundry bleach containing 5.25% hypochlorite. If the bleach has been opened for an extended period or has been diluted, increase the amount added. If the water is cloudy in appearance, repeat the procedure.

<sup>2</sup> Dry iodine tablets.

<sup>3</sup> Liquid iodine solution. Label concentration of 2.0% iodine. If a tincture of iodine is used with a different stated iodine concentration, the usage level may be calculated as follows: Drops/gal = 80 divided by the % iodine in the concentrated solution.

Table 2. Partial list categorizing refrigerated food stability.

Perishable Foods	More Stable, Less Perishable Food
Baby formula, opened	Beef jerky
Chicken	Butter/margarine, higher fat
Cold cuts	Canned fruits
Custard pies	Fruit juices
Deli meats	Hard cheeses
Fresh cut fruits and vegetables	Jam, jellies or preserves made with sugar
Hamburger	Ketchup
Leftovers	Mayonnaise, commercial
Low-fat margarine or spreads	Mustard
Meat	Peanut butter
Milk	Pickles
Milk products	Steak sauces and related items
Poultry	Sterile shelf milk (Brik Pak) and beverages, unopened
Seafood	Syrups
Shredded cheeses	
Soft cheeses	